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W. Evans

Dated 14 September 2000

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1.	Your reference	P57783V		
2.	Patent application number (The Patent Office will fill in this part)	9919274.2 1780077 2467097-1 002813 1/7700 0.00 - 9919274.2		
3.	Full name, address and postcode of the or each applicant (underline all surnames)	Elekta Oncology Systems Ltd Linac House Fleming Way Crawley West Sussex RH10 2RR		
Patents ADP number (if you know it)		7721822001		
If the applicant is a corporate body, give the country/state of its incorporation		Great Britain		
4.	Title of the invention	Portal Imaging Device		
5.	Name of your agent (if you have one)	Fry Heath & Spence		
"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)		The Old College 53 High Street Horley Surrey RH6 7BN		
Patents ADP number (if you know it)		05880273001		
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		*	*	*
7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing (day/month/year)	
		*	*	
8.	Is a statement of inventorship and or right to grant of a patent required in support of this request? (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body; See note (d))	Yes		

Patents Form 1/77

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Continuation sheets of this form

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Description

7

Claim(s)

2

Abstract

1

Drawings(s)

5

as 8

10. If you are also filing any of the following, state how many against each item.

Priority documents

0

Translations of priority documents

0

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

0

Request for preliminary examination and search (Patents Form 9/77)

0

Request for substantive examination (Patents Form 10/77)

0

Any other documents (please specify)

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11.

I/We request the grant of a patent on the basis of this application

Signature

Victoria J Maddison

Date 16 August 1999

12. Name and daytime telephone number of person to contact in the United Kingdom

Victoria J Maddison

01293 776880

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Notes

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PORTAL IMAGING DEVICE

This invention relates to radiation treatment apparatus, in particular portal imaging systems comprising a rotatable gantry, supported by a stand, a radiation emitting head coupled to the gantry and an imaging device for providing, in visual form, a representation of the radiation beam emitted from the head after it has passed through the object under treatment. In particular the invention relates to apparatus for mounting the imaging device on the gantry of the radiation treatment apparatus.

European Patent No. EP 0541717 identifies a problem with portal imaging devices, that being that in order for the lightweight boxes to cover a reasonable radiation field size, the construction of the detector enclosure has to be very bulky, this poses an inconvenience during patient set up and occupies space in the treatment room when not being used. Practical use of such devices has thus, historically been quite limited. That Patent goes on to describe an apparatus for mounting the imaging device to the gantry of a radiation treatment apparatus in which the imaging device is fixed to the end of a telescopically extendable holding means the holding means being arranged such that when not in use the majority of the holding apparatus and imaging device is retracted into the body of the gantry.

Whilst this arrangement provides a convenient means of storing the imaging device and associated mounting apparatus, the mounting apparatus is integral with the gantry of the radiation treatment apparatus and must therefore be built into the apparatus during manufacture. Additional disadvantages of this arrangement arise where parts of the mounting

connected to the telescopically extendable arm.

Conveniently, the arm may comprise two or more elongate elements arranged in slidable communication with each other. Optionally, the slidable communication is provided by means of one or more linear bearings located between the elongate elements. The elongate elements may optionally be arranged to slide one inside another or alternatively side by side. To provide optimum stability, the arm is preferably pivotally mounted substantially about its centre of mass. Most preferably the arm is pivotally mounted substantially about the centre of mass of the arm and imaging device assembly.

Optionally, the holder is slidably mounted to slide along the extendable arm. This arrangement provides for more compact retraction of the arm and image device assembly as well as more freedom in positioning the image device relative to the radiation head. The holder may further comprise means for permitting linear motion of the imager device along an axis perpendicular to the longitudinal axis of the extendable arm. This arrangement provides a further degree of freedom in positioning the imaging device with respect to the radiation emitting head and when provided along with a slidably mounted holder provides for the imaging device to be easily locatable about a relatively large area.

As a further option, the apparatus may be provided with means for moving the image device radially along the surface of the gantry, toward and away from its centre point. Such means may comprise, for example, a slider on the surface of the gantry or a pivot and linkage system connecting the components of the apparatus.

Preferably the holder is detachable from the imaging device, permitting the imaging device to be removed for storage or replacement. Preferably, the holder has means for locking the position of the imaging device when the

kilovolt measurements.

A particular advantage of this arrangement is provided where the pivot about which the arm is mounted is offset from the end of the arm, this enables the arrangement to be self counter balancing when retracted and minimises any movement about the arm when extended. The inherent stability of this arrangement means that the forces to be overcome on extension and retraction are primarily frictional or inertial and can easily be overcome either manually or with simple electro-mechanical actuation devices.

It is also to be appreciated that the small framed lightweight arrangement is easy to manoeuvre around even when partially stowed.

The invention will now be further described by way of example with reference to the Figures, in which:-

Figure 1 shows an apparatus for positioning an imaging device relative to the gantry of radiation therapy apparatus substantially as described in European Patent EP 0541717;

Figure 2 shows a schematic of the surface mountable folding apparatus also described above;

Figure 3 shows an embodiment of the present invention in its fully extended position in both a perspective and side view;

Figure 4 shows the embodiment of Figure 3 in a partially retracted position;

Figure 5 shows the embodiment of Figure 3 with the arms and imaging device fully retracted;

Slidably connected to the distal portion 14 of the slidable arm is an imaging device holder 17 which is slidable along linear bearing 16. Mounted on the holder 17 is an imaging device 3. Imaging device 3 is slidable with respect to holder 17 by means of linear bearing 18.

As can be seen from the Figure the imaging device 3 is free to move along two perpendicular axes defined by linear bearings 16 and 18.

In Figure 4, the distal portion 14 of the extendable arm 13, 14 has been moved towards the surface of gantry 1 by means of linear bearing 15. Movement of the slidable arm 14 in linear bearing 15 together with movement of linear bearing 18 of holder 17 allows the imaging device 3 to be locatable about a relatively large viewing area.

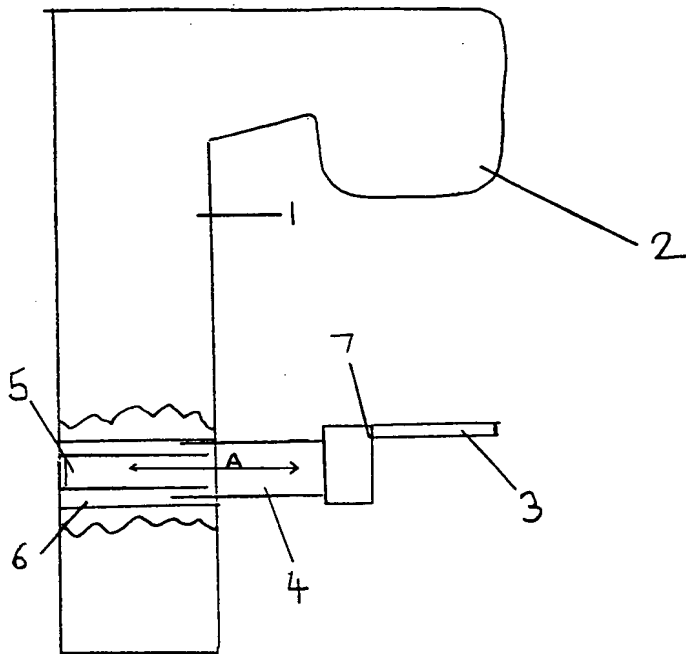
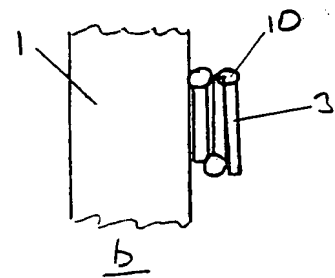
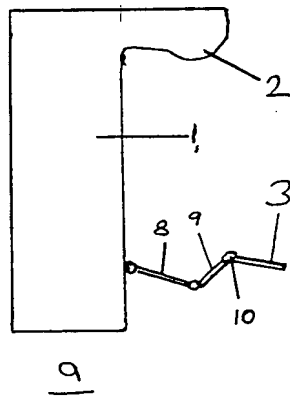
In Figure 5 holder 17 has been moved from a relatively distal to a relatively proximal position on the extendable arm 13, 14 drawing the imaging device 3 closer to the surface of the gantry 1. This partially retracted position provides more convenient access to the patient during treatment.

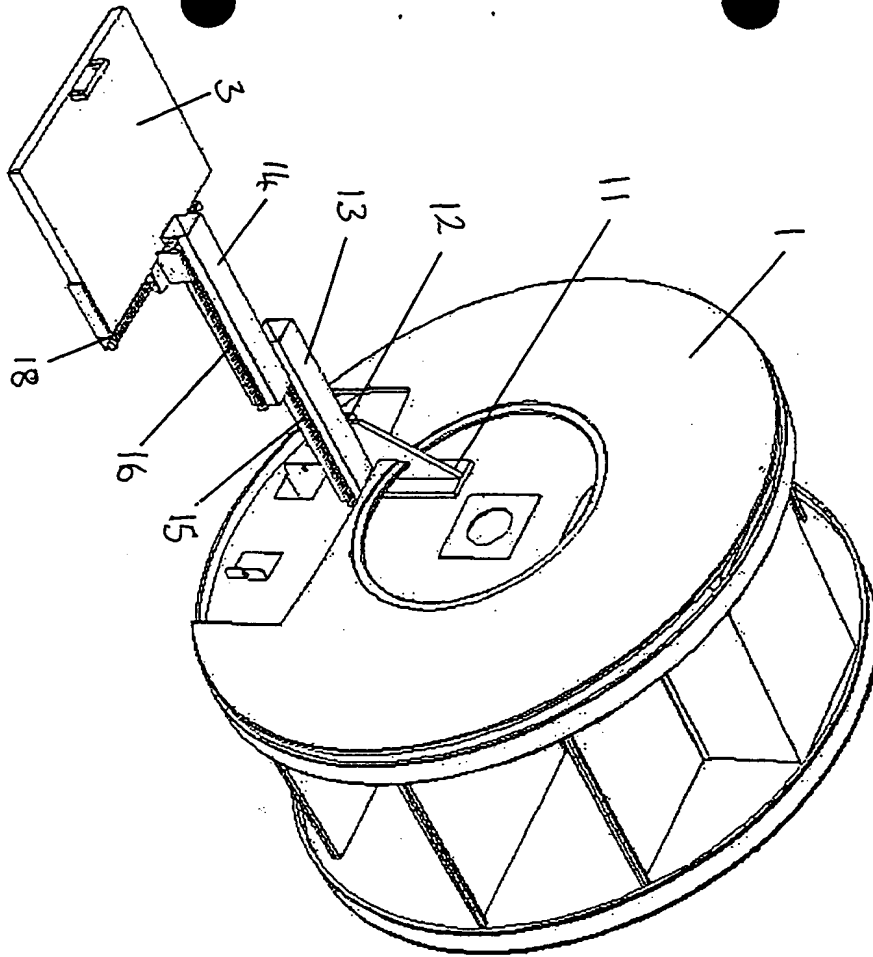
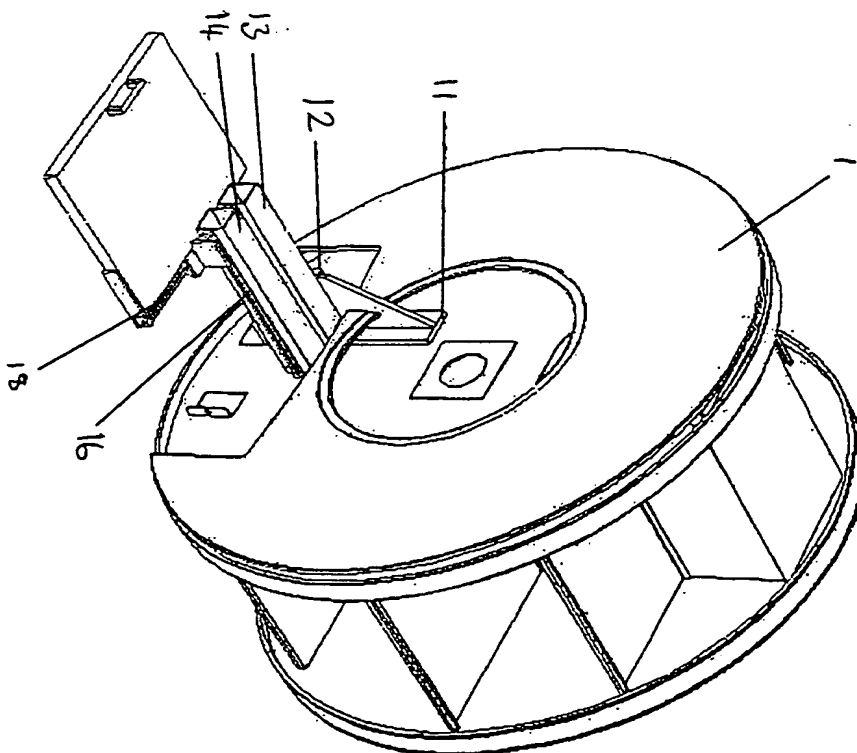
Figure 6 illustrates how the apparatus, fully retracted as shown in Figure 5, can be pivoted about pivot 12 towards a stowing position substantially flush with the surface of gantry 1.

Finally, Figure 7 illustrates the apparatus in fully stowed position.

The foregoing describes only one embodiment of the invention to aid understanding and is not intended to be in any way limiting from the true scope of the invention as defined in the appended claims.

9. Apparatus as claimed in any preceding claim wherein the holder is detachable from the imaging device and/or the extendable arm.
 10. Apparatus as claimed in any preceding claim wherein the holder comprises means for locking the position of the imaging device.
 11. Apparatus as claimed in any preceding claim further comprising means for rotating the imaging device about an axis parallel to longitudinal axis of the extendable arm.
 12. Apparatus as claimed in any preceding claim comprising a counterbalancing means for holding the extendable arm under gravity in any given angular position relative to the surface of the gantry.
 13. Apparatus substantially as described herein with reference to Figures 2 to 8.
 14. Apparatus as claimed in any preceding claim wherein the apparatus is actuated by mechanical or electro-mechanical means.
 15. A radiation therapy apparatus comprising apparatus for positioning an imaging device substantially as described in any preceding claim.
 16. A radiation therapy apparatus comprising two or more apparatus as claimed in any one of claims 1 to 13.
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FIGURE 1FIGURE 2

FIGURE 3aFIGURE 4

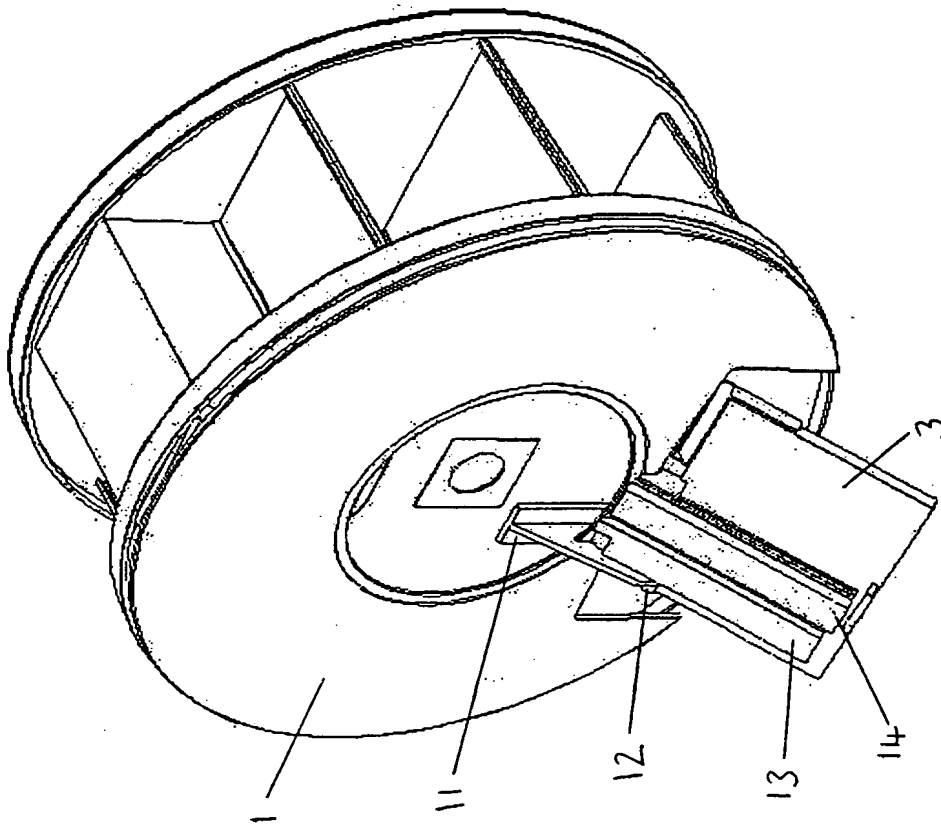


FIGURE 6

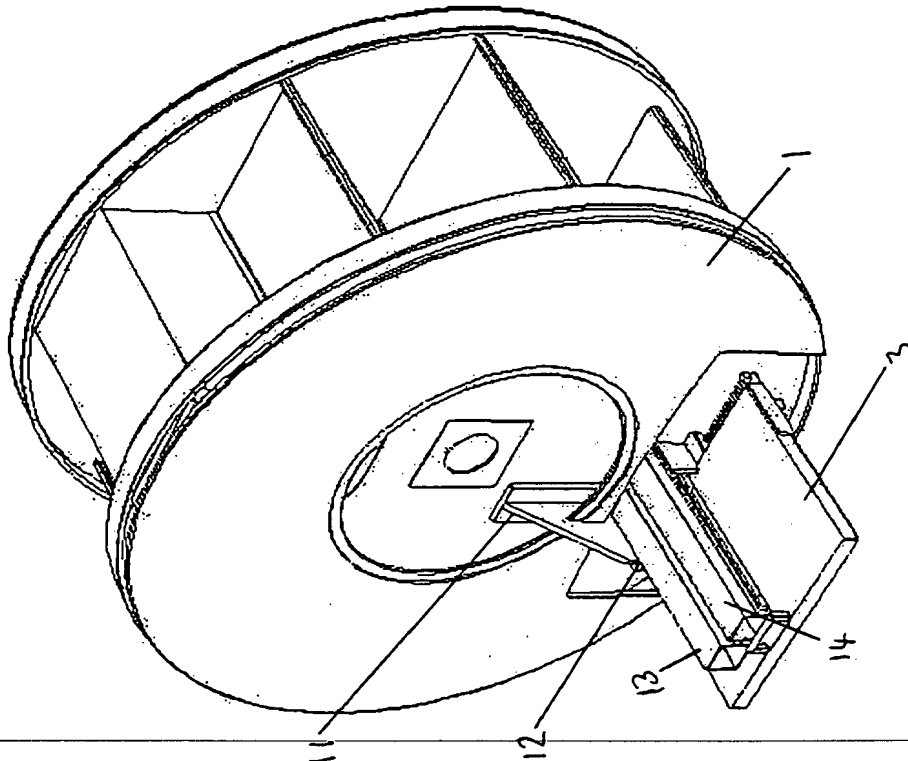


FIGURE 5

FIGURE 7b

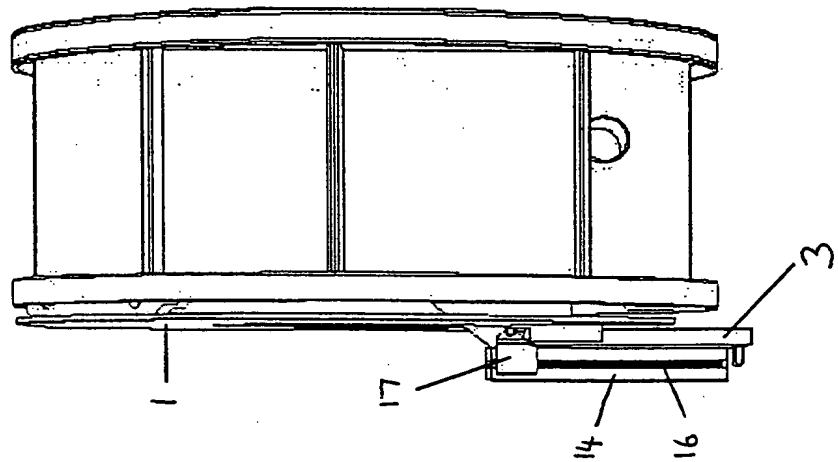
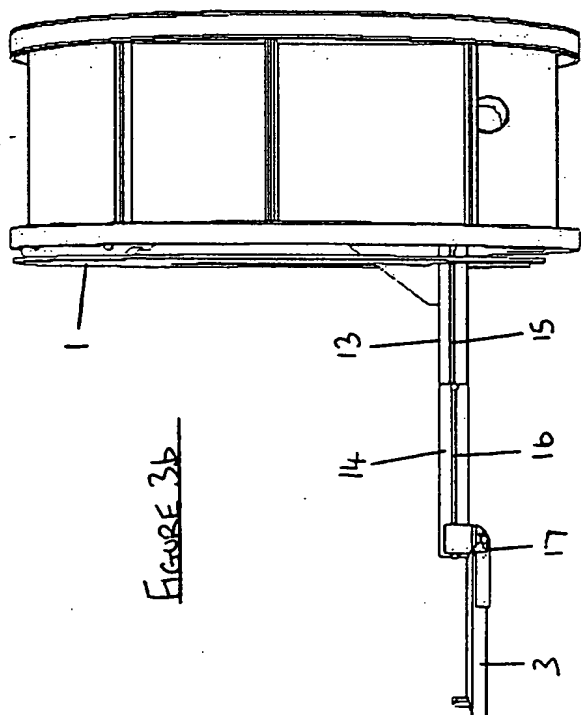


FIGURE 3b



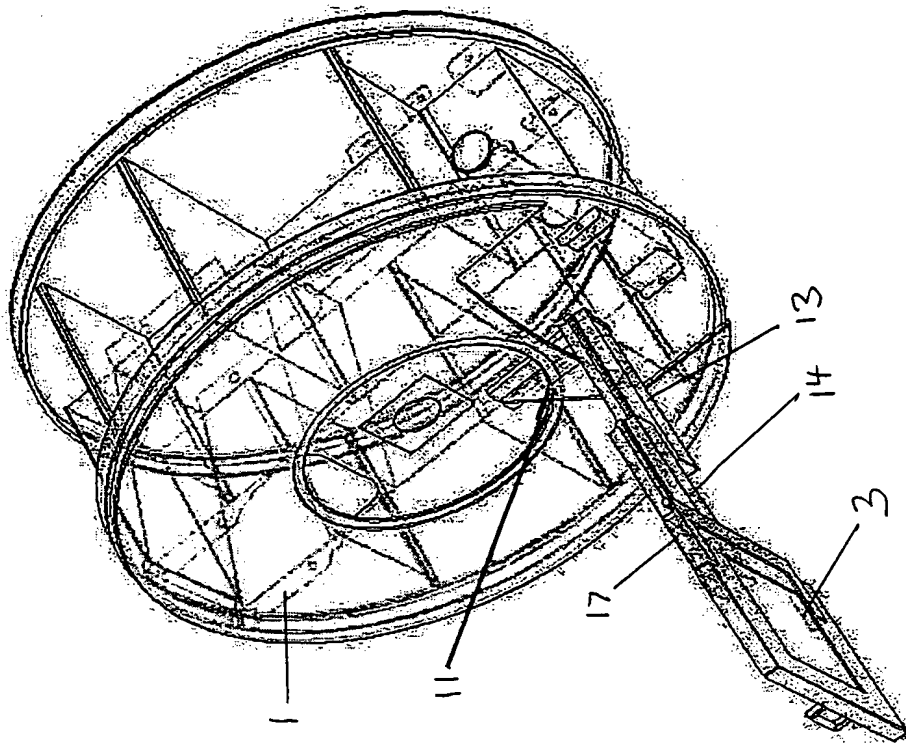


FIGURE 8

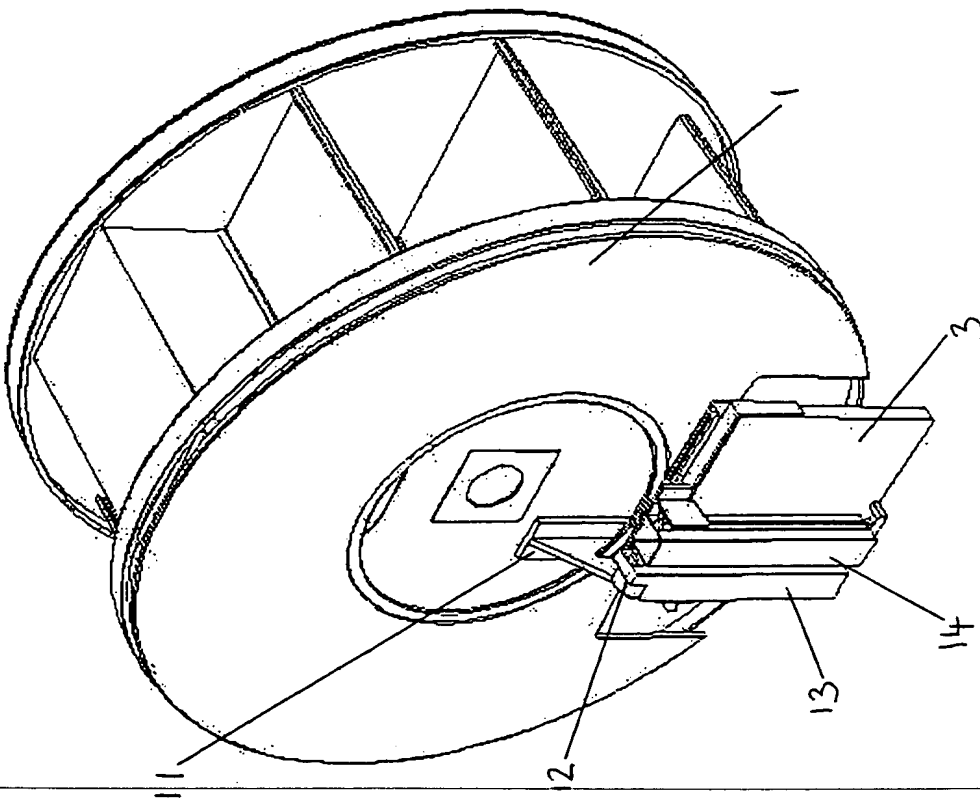


FIGURE 7a



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